Genetic Ablation of the Stem Cell Niche Leads to Loss of Stem Cells and Failure of Lineage Renewal

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Stem cells reside within specialized microenvironments, or niches, that control many aspects of stem cell behavior, including the fundamental cell fate decision between maintenance of stem cell function and initiation of differentiation. The somatic apical hub cells at the tip of the *Drosophila* testis are a primary component of the male germ line stem cell niche. Hub cells secrete the ligand Unpaired (Upd), which activates the Janus Kinase-Signal Transducer and Activator of Transcription (JAK-STAT) pathway in adjacent germ line stem cells (GSCs) to specify stem cell self-renewal (1, 2). We demonstrate that mutations in the gene encoding the transcriptional repressor *escargot* (*esg*) result in loss of the male GSC niche. Consequently, GSCs are not maintained and the male germ cell lineage is lost. Adherens junctions are concentrated along the interface between hub cells and adjacent germ line stem cells and serve to hold stem cells within the niche and close to self-renewal signals. In wild type testes, the *Drosophila* E-cadherin homolog Shotgun (Shg) is localized to hub cell-hub cell and hub cell-GSC junctions. However, expression of Shg in the apical hub is lost in *esg* mutant testes, leading to breakdown of the hub during development. Failure to maintain GSCs due to loss of the niche emphasizes the role of extrinsic factors in controlling stem cell behavior and maintenance of tissues.

References

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